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Willem is a System Engineer and project manager within the department of Intelligent Imaging of TNO Technical Sciences located in the Hague (the Netherlands). He has seven years of experience in the development and evaluation of inspection and monitoring methods for road and railway infrastructure. Willem's current key projects include the development of fully automated 'in-traffic' pavement inspections of porous asphalt regarding raveling and cracking.

Title of the presentation: Automated Ravelling Inspection And Maintenance Planning On Porous Asphalt In The Netherlands

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Name of the project: Road measurement and monitoring

Under the authority of Rijkswaterstaat ((the Dutch Ministry of Infrastructure and Environment), an automated road pavement inspection system has been developed and deployed. Previously, the amount of ravelling and the remaining life expectancy of each 100 metre section of porous asphalt were estimated by means of visual inspections. These visual inspections are time consuming, partially ambiguous and sometimes it is not possible, or too dangerous, to inspect a section. The developed system is integrated in a vehicle which can operate at speeds up to 120 km/h and can be used in normal traffic. The measurement system is based on high-speed measuring height profiles by means of laser triangulation. The system makes it possible to generate a detailed 3D road surface with a (in plane) resolution of 1.0 by 4.7 mm. From the 3D surface, the type of asphalt is classified by means of texture analysis. The amount of ravelling (stone loss) is computed from the 3D surface by means of a specifically develop algorithm after several pre-processing steps. The ravelling data is used to compute the remaining life expectancies for each 100 metre section. The model is based on a training set of more than 5000 sections, each visually inspected by experts. The system is capable of correctly predicting the remaining life expectancy of each section in more than 94% of the cases.

At the moment there is a four year experience with the developed system, which measured the complete Dutch highway infrastructure in 2013 and 2014 (>14,000 km and 15 Tbyte of raw data per year). Life expectations were computed for all porous asphalt sections and were successfully used by Rijkswaterstaat for their maintenance planning. The system is developed using combined knowledge on sensor technology, computer vision, handling large amount of data, high performance computing and statistical modelling.